

New Ideas on Binding and Binding Theory

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- Binding
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- Index-Binding
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- Evidence
 - Pronouns und Focus
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- Concepts
 - Maximal Concepts
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Overview

(1) Every boy called his (own) mother.

Pronoun does not stand for the binder.

(2) Every boy called every boy's mother.

Index-Binding: Pronouns are indexed variables (Quine, 1960).

(3) [Every boy]_x called x's mother.

Applications: island constraints (Ross, 1968), binding theory (Chomsky, 1981), DRT (Kamp and Reyle, 1993), HPSG (Pollard and Sag, 1994), ...

Flat Binding: Pronouns are definite descriptions.

(4) Every boy talked to the boy's mother.

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Index-Binding (Frege, Tarski)

A recursive interpretive procedure assigns semantic values to constituents relative to a model and an assignment.

- ▶ Assignments are sequences (functions from indices to values).
- ▶ Bound elements are indices (*Variables*).
- ▶ Binders are indexed operators (specifically: λ_i).

Interpretation rules for pronouns, traces, and binders (Heim and Kratzer, 1998).

- (5)
- a. $\llbracket \text{pro}_i \rrbracket^g = \llbracket t_i \rrbracket^g = \llbracket i \rrbracket^g = g(i)$
 - b. $\llbracket \lambda_i \alpha \rrbracket^g = \lambda x: \llbracket \alpha \rrbracket^{g[i \mapsto x]}$

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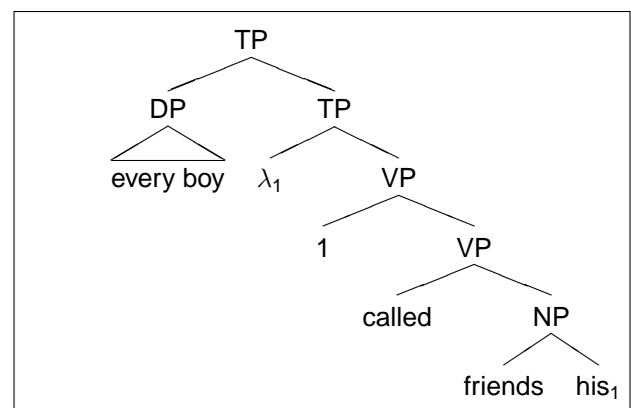
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Index-Binding: Example, Step 1

(6) Every boy called friends of his.



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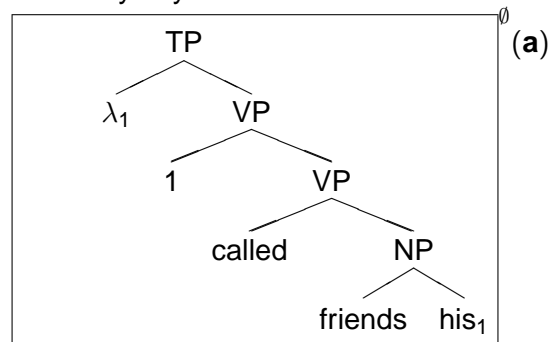
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Index-Binding: Example, Step 2

(6) Every boy called friends of his.

For every boy **a**:



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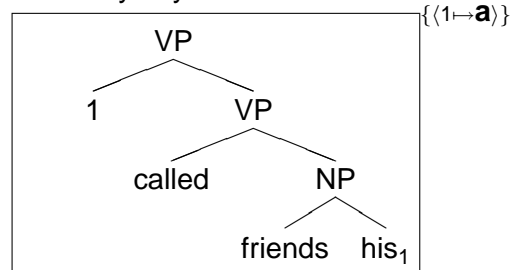
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Index-Binding: Example, Step 3

(6) Every boy called friends of his.

For every boy **a**:



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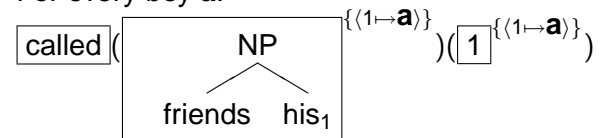
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Index-Binding: Example, Step 4/5

(6) Every boy called friends of his.

For every boy **a**:



= For every boy **a**: **called(friends(a))(a)**

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Flat Binding

Assumption kept: A recursive interpretation procedure assigns semantic values relative to model and assignment.

The following three assumption, however, are different:

- ▶ Assignments are sets.
- ▶ Bound elements are definite descriptions.
- ▶ Binders are unindexed operators λ .

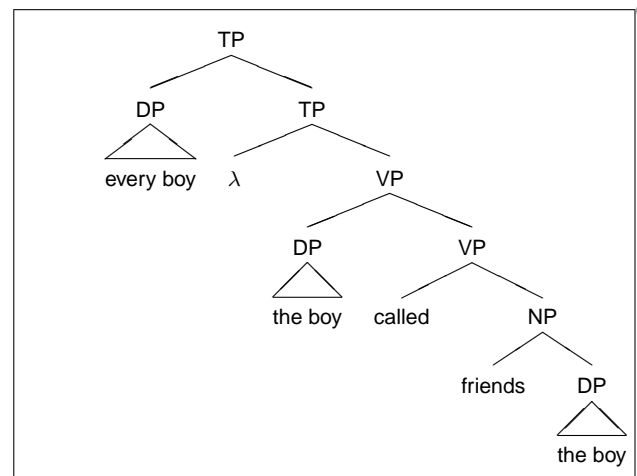
New interpretation rules for bound elements and binders:

- (7)
- a. $\llbracket \text{the} \rrbracket^\ell(P) = \iota x \in \ell : P(x) = 1$
 - b. $\llbracket \lambda \alpha \rrbracket^\ell = \lambda x : \llbracket \alpha \rrbracket^{\ell \cup \{x\}}$

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Flat binding: example 1, step 1

(8) Every boy called friends of his.



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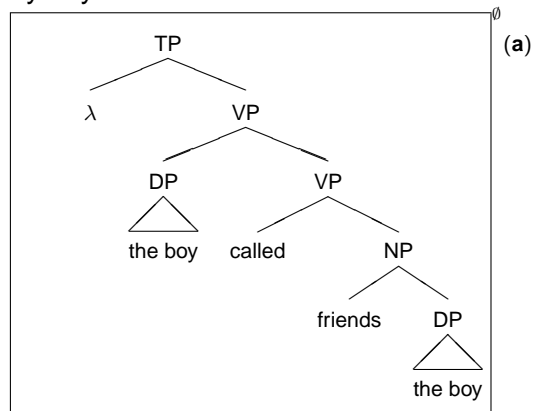
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Flat Binding: Example 1, Step 2

(8) Every boy called friends of his.

For every boy **a**:



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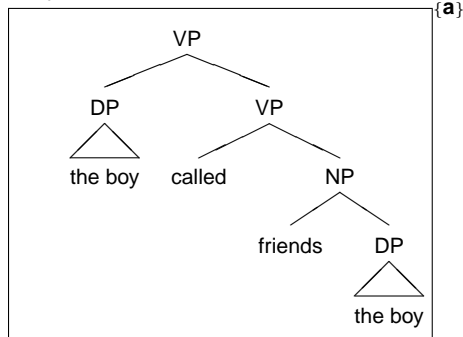
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Flat Binding: Example 1, Step 3

(8) Every boy called friends of his.

For every boy **a**:



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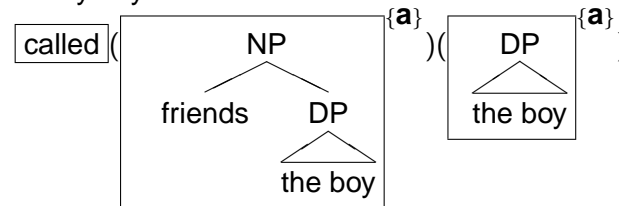
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Flat Binding: Example 1, Step 4

(8) Every boy called friends of his.

For every boy **a**:



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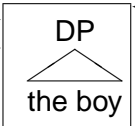
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Flat Binding: Example 1, Step 5/6

(8) Every boy called friends of his.

For every boy **a**:

called(**friends**(^{**a**}))(a)

= For every boy **a**: **called**(**friends**(a))(a)

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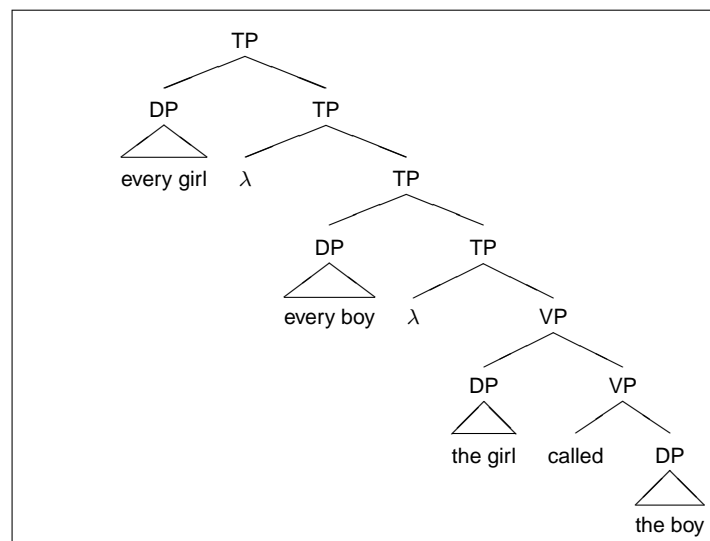
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Flat Binding: Example 2, Step 1

(9) Every girl called every boy.



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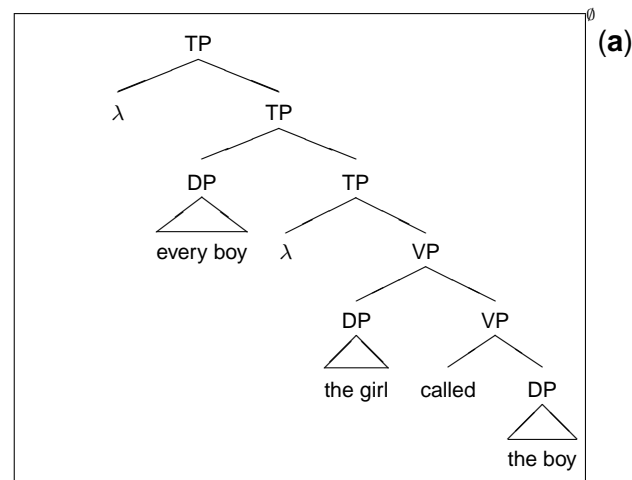
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Flat Binding: Example 2, Step 2

(9) Every girl called every boy.

For every girl **a**:



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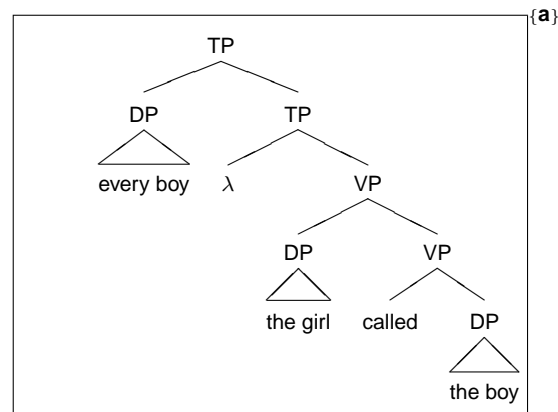
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Flat Binding: Example 2, Step 3

(9) Every girl called every boy.

For every girl **a**:



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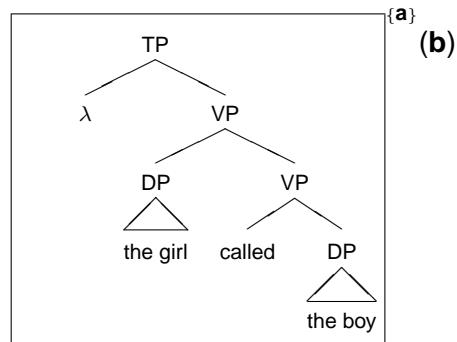
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Flat Binding: Example 2, Step 4

(9) Every girl called every boy.

For every girl **a** and for every boy **b**:



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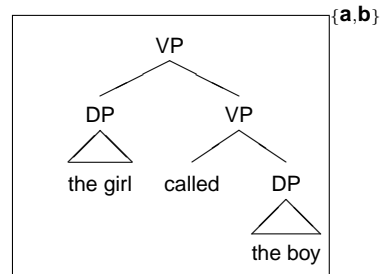
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Flat Binding: Example 2, Step 5

(9) Every girl called every boy.

For every girl **a** and for every boy **b**:



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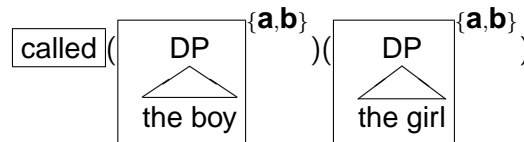
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Flat Binding: Example 2, Step 6/7

(9) Every girl called every boy.

For every girl **a** and for every boy **b**:



= For every girl **a** and for every boy **b**:

called(b)(a)

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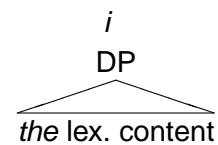
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Evidence for Lexical Content

One important difference of the two theories:

Index-binding Traces/Pronouns
Flat binding Traces/Pronouns



Phenomenon	Elements	Reference
principle C	traces	(Chomsky, 1993; Fox, 1999)
ellipsis	traces	(Sauerland, 1998, 2004a)
ellipsis	traces&pron.	(Merchant, 1998)
focus	pronouns	(Sauerland, 2000, 2004b)
focus	traces	(Sauerland, 2001)
gramm. gender	pronouns	—

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Pronouns and Focus

Contrastive focus marks meaning differences (see Schwarzschild 1999):

- (10) On Monday, Mary praised Bill, and . . .
- a. . . on [Tuesday]_F, Mary praised [JOHN]_F.
 - b. #on [Tuesday]_F, [MARY]_F praised [JOHN]_F.

Two bound pronouns can be contrasted, if and only if their lexical content is different (Sauerland, 1998, 2000, 2004b).

- (11) On Monday, every boy called his mother, and . . .
- a. . . on [Tuesday]_F, every [TEAcher]_F called [HIS]_F mother.
 - b. #. . . on [Tuesday]_F, every boy called [HIS]_F mother (again).

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Flat binding explains this contrast:

- (12) every boy λ the boy called the boy's mother,
and ...
- a. ... every teacher λ the teacher called [the
teacher]_F's mother
- b. #... every boy λ the boy called [the boy]_F's
mother

Index-binding has no explanation for the contrast:

- (13) every boy λ_1 1 called 1's mother, and ...
- a. ... every teacher λ_1 1 called [1]_F's mother
- b. #... every boy λ_1 1 called [1]_F's mother

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Traces and Ellipsis

VP-Deletion requires an antecedent with identical interpretation (Tancredi, 1992).

(14) Kai waved at him and Lina did, too.

VP-deletion in (15) is only possible, if both traces have the same lexical content (Sauerland, 2004a):

- (15) a. *Polly visited every town that is near the lake Erik did.
b. Polly visited every town that is near the one Erik did.

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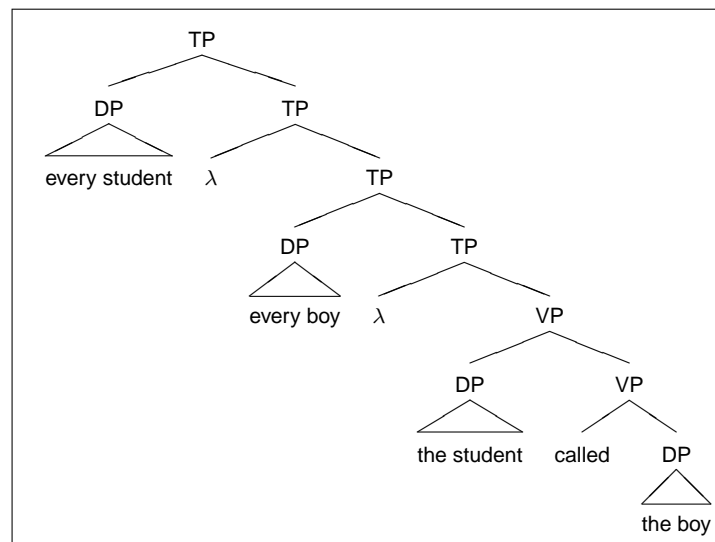
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- (17) [every town that is near the lake/one λ_1 Erik
 $\underbrace{\text{visited } 1}_{\text{elided}} \lambda_1$ Polly $\underbrace{\text{visited } 1}_{\text{antecedent}}$]

Overlap

(18) Every student called every boy.



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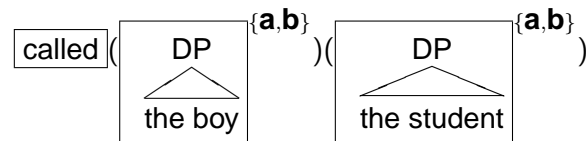
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Overlap

(18) Every student called every boy.

= For every student **a** and for every boy **b**:



If **a** is a student and a boy and **b** is another boy, *the boy* doesn't refer.

Example (18) is only sensibly interpretable if there is no overlap between students and boys.

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Principle B

Principle B rules out coreference in (19a):

- (19) a. Zelda is talking to her. (her \neq Zelda)
b. Zelda is talking to herself.

Why doesn't (20) violate Principle B (Evans, 1980; Heim, 1998)?

- (20) A: Is Zelda the author of this paper?
B: How can you doubt it? *She is praising her to the sky.* No other author would do that.

She and *her* refer to two different concepts: *the author* and *Zelda*.

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Concepts

(Individual-)Concepts are functions from possible worlds to individuals.

We can understand definite descriptions as concepts:

(21) the author, the person named *Zelda*

- (22) a. $x_{author}: w \mapsto \text{the author in } w$
b. $x_{Zelda}: w \mapsto \text{the person with name } Zelda \text{ in } w$

A concept x has property P , if the following holds:

(23) $\forall w \in \text{domain}(x): P(x(w))$

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Maximal Concepts

- (24) Definition: A concept x is **maximal for property P** , if:

$$\text{domain}(x) = \{w \mid \exists y : P(y(w))\}$$

A maximal P -Concept possesses no author properties other than P worth mentioning:

- (25) If x is a maximal concept for property P , the following holds for every property Q other than P : Q is a logical consequence of P , or $Q(x)$ is false.

For example: $P = \text{girl}$, $Q = \text{under 20 years old}$

We can imagine a possible world where humans first live as genderless caterpillars underground before they hatch. A maximal girl-concept must select a 20-year old individual in this world.

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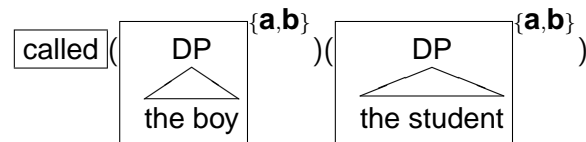
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Quantifier Binding Without Overlap

(18) Every student called every boy.

For every maximal student-concept **a** and for every maximal boy-concept **b**:



A maximal student-concept **a** never has the property *boy* and a maximal boy-concept **b** never has the property *student*.

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Identitcal Restrictors

Sentence with identical restrictors can be reduced to overlap.

(26) Every coach voted for every coach.

Quantifier can always have additional, elided restrictors (Westerståhl, 1985; Stanley and Zsabo, 2000): (27) can mean that the sailors on board wave to the sailors on shore.

(27) Every sailor waved to every sailor. (Stanley and Williamson, 1995)

In (26), the elided restrictors can be extensionally equivalent. (28) is a possible representation:

(28) Every coach with permission to vote voted for every candidate coach.

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Contextual Concepts

(29) Context set C = Set of all possible worlds, in which all propositions are true that all discourse participants agree are true (Stalnaker, 1978).

(30) Definition: A concept x is **contextual** if:
 $\text{domain}(x) = C$

Contextual concepts generally have many properties.
For example, a contextual girl-concept also has the property *younger than 20 years*.

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Discourse vs. Quantifier Binding:

- (31) a. The assignment set at the beginning of interpreting a sentence contains the discourse-salient concepts.
Discourse-salient concepts are always contextual.
- b. λ -operators add in the course of sentence interpretation new concepts to the assignment set.
Quantifier binding (or the λ -operator) always add maximal concepts.

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- (32) A: Is Zelda the author of this paper?
B: How can you doubt it? *She is praising her*
to the sky. No competing candidate would
do that.
A: *?You're right, I agree with you. Oh look,
here *she is praising her* again.

Discourse *before* B's utterance: no coreference:

- (33) $C, \{x_{author}, x_{Zelda}\}$

Discourse *after* B's utterance: Coreference:

- (34) $C' = C \cap \{w \mid x_{author} = x_{Zelda}\}, \{x_{author/Zelda}\}$

Namely: $x_{author}|_{C'} = x_{Zelda}|_{C'}$.

General principle:

- (35) Update of $\langle C, d \rangle$ with ϕ : $\langle C \cap \phi, \{c \cap \phi \mid c \in d\} \rangle$

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Summary

- ▶ Binding in Language: Storage in a set, reference by unequivocal description of a stored element
- ▶ Quantifier binding uses maximal concepts, discourse binding uses contextual concepts.

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Predictions and Directions

- ▶ All bound elements must be of type *e* (Landman, 2004) (cf. no QR of verbs, obligatory reconstruction of VPs (Heycock, 1995))
- ▶ Conservativity, *only*
- ▶ Ellipsis licensing in DPs
- ▶ Binding into Intensional Contexts
- ▶ Dynamic Binding
- ▶ Agreement on Bound Elements
- ▶ Binding Theory

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Incorporating Dynamic Binding

Contextual Concepts can also be added during the evaluation.

(36) Every farmer who owns a donkey feeds it.

(37) Every farmer who owns a donkey feeds the donkey of the farmer.

Idea: a *donkey* leads to the accomodation of a contextual donkey concept per farmer, which is added to the assignment set.

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Condition A/B

- (38) a. John/Every boy talked to him.
b. John/Every boy talked to himself

Pragmatic principle: Use *self* as much as possible.

Condition C

- (39) a. He read that John is sick.
b. He read that he is sick.

Pragmatic principle: Elide as much as possible (cf. Schlenker 2004)

Both pragmatic principles might follow from maximize presupposition.

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